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ABSTRACT

The Appalachian Education Satellite Project (AESP) was designed to apply communications satellite technology to the task of improving the quality of education in Appalachia. This report is the 10th in a 12 volume series. To justify the cost of using the satellite method, a cost model was developed. This cost model provided information on: (1) the cost to develop, produce, transmit, and handle each of the learning activities in the courses produced by the AESP; (2) the effect on course costs of adding or deleting learning activities; (3) the per-student cost variance as a function of the various factors; and (4) the point where education by satellite is efficient in relation to alternative methods of instruction. Twelve figures illustrate the formulas for calculating what it costs to develop, produce, and evaluate the different AESP learning activities. Eleven tables of cost estimates are also included. Detailed information that breaks down the cost of each element is appended. (Author/DS)

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COST ESTIMATION MODEL FOR ALTERNATIVE FORMATS AND DELIVERY MODES

appalachian education satellite project

Technical Report

number 10

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September, 1975

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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The Technical Report Series of the Appalachian Education Satellite Project is edited and published by the RCC Evaluation Component at the University of Kentucky, Lexington, Kentucky.

The purpose of this series is to document and disseminate information about the design, implementation and results of the AESP experiment.

William J. Bramble and Cathy Whitton

Editors

TECHNICAL REPORT SERIES #1 - 12

1. AESP Data Base Information: Rationale, Data Collection Procedure, Interpretation of Results. Prepared by William J. Bramble, Claudine Ausness, Larry Harding and Robert Wetter. Winter 1973.

2. An Experiment in Educational Technology: An Overview of the Appalachian Education Satellite Project. Prepared by Claudine Ausness and Betty Bowling. March, 1974.

3. Formative Evaluation Study for AESP Diagnostic and Prescriptive Reading Courses. Prepared by William J. Bramble, Claudine Ausness and Robert Wetter. October, 1974.

4. The Evaluation Design: Summer Courses, 1974. Prepared by William J. Bramble, Claudine Ausness, Robert Wetter and Larry Harding. December, 1974.

5. Performance of AESP Transmission/Reception Equipment (Summer and Fall, 1974). Prepared by William J. Bramble, Claudine Ausness and James R. Freeman. July, 1975.

6. User Ratings of Instructional Activities: Diagnostic and Prescriptive Reading Instruction, Summer, 1974. Prepared by Rodger Marion, William J. Bramble, Robert Wetter and Cathy Whitton. July, 1975.

7. User Ratings of Instructional Activities: Career Education in the Elementary Grades, Summer, 1974. Prepared by Larry Harding, William J. Bramble and Rodger Marion. August, 1975.

8. User Achievement: Diagnostic and Prescriptive Reading Instruction Course, Summer, 1974. Prepared by William J. Bramble, Rodger Marion and Claudine Ausness. August, 1975.

9. User Achievement: Career Education in the Elementary Grades, Summer, 1974. Prepared by Rodger Marion, William J. Bramble and Claudine Ausness. August, 1975.

10. Cost Estimation Model for Alternative Course Formats and Delivery Modes. Prepared by William J. Bramble, Claudine Ausness, and Donna Martens. September, 1975.

11. Summative Evaluation of Career Education in the Secondary School Course, Fall, 1974. Prepared by Diane Maynard, Rodger Marion and William J. Bramble. September, 1975.

12. Summative Evaluation of Diagnostic and Prescriptive Reading Instruction CR Course, Spring, 1975. Prepared by William J. Bramble, Diane Maynard and Rodger Marion. September, 1975.

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
LIST OF FIGURES	v
LIST OF APPENDICES	vi
INTRODUCTION	1
RATIONALE	6
METHOD	10
Identification of Cost Formulators	10
Identification of Types of Variables	11
Identification of Data Collection Strategies	12
RESULTS	13
Description of Production Cost Formulas	13
Description of Delivery Cost Formula	20
Description of Local Coordination Cost Formulas	24
Description of Central Coordination	29
Description of a Course	31
CONCLUSIONS	40
Validity of the Information	40
APPENDICES	42
BIBLIOGRAPHY	60

LIST OF TABLES

Table		Page
1	COST OF [illegible] TELEVISED PROGRAM PRODUCTION	[illegible]
2	COST OF [illegible] TELEVISED PROGRAM	[illegible]
3	COST OF [illegible] TRANSCEIVER, RADIO [illegible]	[illegible]
4	COST OF [illegible]	[illegible]
5	COST OF [illegible]	[illegible]
6	COST OF DELIVERY OF LIVE OR TAPED TELEVISED PROGRAMS AND TRANSCEIVER, RADIO OF [illegible]	[illegible]
7	COST OF DELIVERY OF [illegible] OF [illegible] AND [illegible] TO PROGRAMS FOR [illegible]	[illegible]
8	COST OF [illegible] TRANSCEIVER, RADIO [illegible]	[illegible]
9	LOCAL COORDINATION COST	[illegible]
10	CENTRAL COORDINATION COST	[illegible]
11	[illegible] COST OF [illegible]	[illegible]

LIST OF FIGURES

Figure		Page
1	[illegible] DIAGRAM, PRODUCTION, AND DIRECTION EXIT FORMAT	[illegible]
2	LIVE TELEVISION PROGRAM DIAGRAMS, PRODUCTION, AND DIRECTION EXIT FORMAT	[illegible]
3	FAN-CAMERA, MAXI-MOVIE DIAGRAMS, PRODUCTION, AND DIRECTION EXIT FORMAT	[illegible]
4	[illegible] DIAGRAMS, PRODUCTION, AND DIRECTION EXIT FORMAT	[illegible]
5	ON-SITE INTERVIEW LAPEL SYSTEM EXIT FORMAT	[illegible]
6	[illegible] DELIVERY SYSTEM	[illegible]
7	[illegible] DELIVERY SYSTEM	[illegible]
8	SATELLITE DELIVERY OF TELEVISED PROGRAM EXIT FORMAT	[illegible]
9	SATELLITE DELIVERY OF [illegible] EXIT FORMAT	[illegible]
10	FAN-CAMERA, MAXI-MOVIE [illegible] (A-MATRIX TO MOVIE) [illegible] SATELLITE-MOVIE SYSTEM	[illegible]
11	[illegible] CORRECTION EXIT FORMAT	[illegible]
12	[illegible] CORRECTION EXIT FORMAT	[illegible]

LIST OF APPENDICES

Appendix		Page
A	[illegible]	[illegible]
B	[illegible]	[illegible]
C	[illegible]	[illegible]
D	[illegible]	[illegible]
E	[illegible]	[illegible]
F	[illegible]	[illegible]
G	[illegible]	[illegible]
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Students Watching CEE Television Program
at the Cumberland, Maryland, Site

hypothetical teaching situation and four alternative approaches to the problem. The student selected the response he felt was most appropriate by depressing a button on a response pad. The student then heard an explanation on the merits of the response. The audio reviews made use of the ATS-6 capability to simultaneously carry four audio channels on the same signal.

3) A third learning activity delivered by satellite was the live interactive seminar. Forum in format, the seminars made it possible for students to ask experts questions during live television broadcasts. The seminar questions were relayed from ancillary classroom sites, sites with landline teletype capability only, to main sites, sites with the capability to transmit questions to the broadcast studio via ATS-3. The CES course employed the seminar format exclusively. The CEE course and both DPRI courses incorporated 4-5 seminars into the planned programming.

4) The students also had access via ATS-3 to information retrieval systems that made use of computerized procedures. To supplement the materials available through computer searches, there were specially developed resource libraries at each site to make important back-up materials easily accessible.

5) In laboratory sessions the students had the opportunity to apply what they had learned from the televised programs. Supplementary instructional materials designed to augment the television and

four-channel audio instruction were used in completing prescribed lab activities. These activities provided opportunities for group interaction and a sharing of ideas. In addition, unit tests, used during the DPRI and the CEE courses, helped the students determine how well they understood the material covered in each unit.

Information collected by the AESP Evaluation Component helped answer many questions about course effectiveness, such as:

How reliable was the equipment used to transmit the taped and live television programs via satellite?

How well did the participants like the different learning activities?

How much did the students in each course learn?

Did the students change their attitudes toward principles fundamental to course objectives?

Answers to these and other questions about course effectiveness are detailed in the Technical Report Series published by the AESP Evaluation Component.

Briefly summarized, the results indicate that:

It is technically feasible using satellite delivery and inexpensive ground reception equipment to provide graduate education courses to students in dispersed geographical areas.

Site representatives who are non-content experts can administer these courses when provided with sufficient instructions and easy access to the Resource Coordinating Center by means of two-way radio.

Participants in the courses generally mastered the course content and are now applying what they learned in their classrooms.

The course participants preferred the learning activities in the satellite-delivered courses to on-campus graduate education courses with which they were familiar.

RATIONALE

Even if education by satellite is effective from an educational point of view, it still must be justified from a cost point of view. With more restricted educational budgets today than in the 1950's and 1960's, educational funding agencies and the tax-paying public want a well documented answer to the question, "Is this a good way to spend our money?" Another question of interest is: "How can we buy the best and most effective education?"

To obtain information on the costs of various products, the Resource Coordinating Center maintained a detailed bookkeeping system. To make these figures meaningful, it was necessary to develop a cost model to interrelate production costs associated with different learning activities to the costs associated with bringing the instruction to the students.

The cost model described in this report provided information helpful in answering a number of questions about project costs, such as:

1) How much did it cost to develop, produce, transmit and handle each of the learning activities in the courses produced by the AESP?

2) What is the effect on course costs of adding or deleting learning activities?

3) How does per-student cost vary as a function of the various factors?

4) At what point of expansion is education by satellite cost efficient, in relation to alternative ways of instruction?

METHOD

Identification of Cost Parameter

The four cost parameters associated with the AESP course development, production, delivery, and administration were: 1) the development and production of instructional and evaluative materials for in-service teacher education courses; 2) the broadcast and delivery of these materials from the Resource Coordinating Center (RCC) in Lexington, Kentucky, to local classroom sites in Appalachia; 3) the handling of course-related activities at each site and its surrounding community by Regional Education Service Agencies (RESAs); 4) the coordination of the AESP course activities by the RCC in Lexington, Kentucky and the overall project management by the AESP staff within the Appalachian Regional Commission in Washington. These four parameters provide the basis for the cost model and are discussed in the following sections.

The present version of the model supplies costs only for the formats actually implemented by AESP. Therefore, in the production parameter costs, formulas are given for the type and format of learning activities incorporated in the AESP courses. These included taped televised programs; live interactive televised seminars; audio reviews; laboratory activities; and on-site libraries expanded by access to computerized retrieval systems. The cost figures used in the model for the production parameter are based specifically on the cost of the Diagnostic and Prescriptive Reading course offered by AESP in the Summer of 1974 (DPRL K-3). It should be noted that

all reported costs are those for the period of the original KCSP grant (1973-1975). Inflationary factors have not been taken into account in the model.

Similarly, only satellite delivery is considered for the transmission of television and radio activities. An expanded version of the model might consider such alternative delivery systems as state-wide educational television networks, instructional television fixed service stations, site videotape transmission with closed circuit television, slide scanner for individualized study, or a number of other delivery options.

Costs associated with the remaining two parameters, local handling and central coordination also reflect the KCSP structure, central coordination being managed by KRC and the management component at the production center (KCC) and local handling being performed by site coordinators and faculty consultants hired by participating KCSPs. The costs in the model for these two parameters are not course specific as are the costs for production. Rather, the assumption was made that [illegible] costs for these two parameters were spread evenly over the four courses. Therefore, each course was assumed to account for one fourth of the total cost of these two parameters.

Identification of Types of Variables

There are two kinds of variables in the cost model: those that measure the number of units required, quantitative variables, and those that place dollar values on products and services, qualitative or normative variables. By combining these variables in various ways, it is possible to calculate how much it would cost to develop, produce, deliver, handle, and coordinate a variety of courses made up of different combinations of the options.

Identification of Data Collection Problems

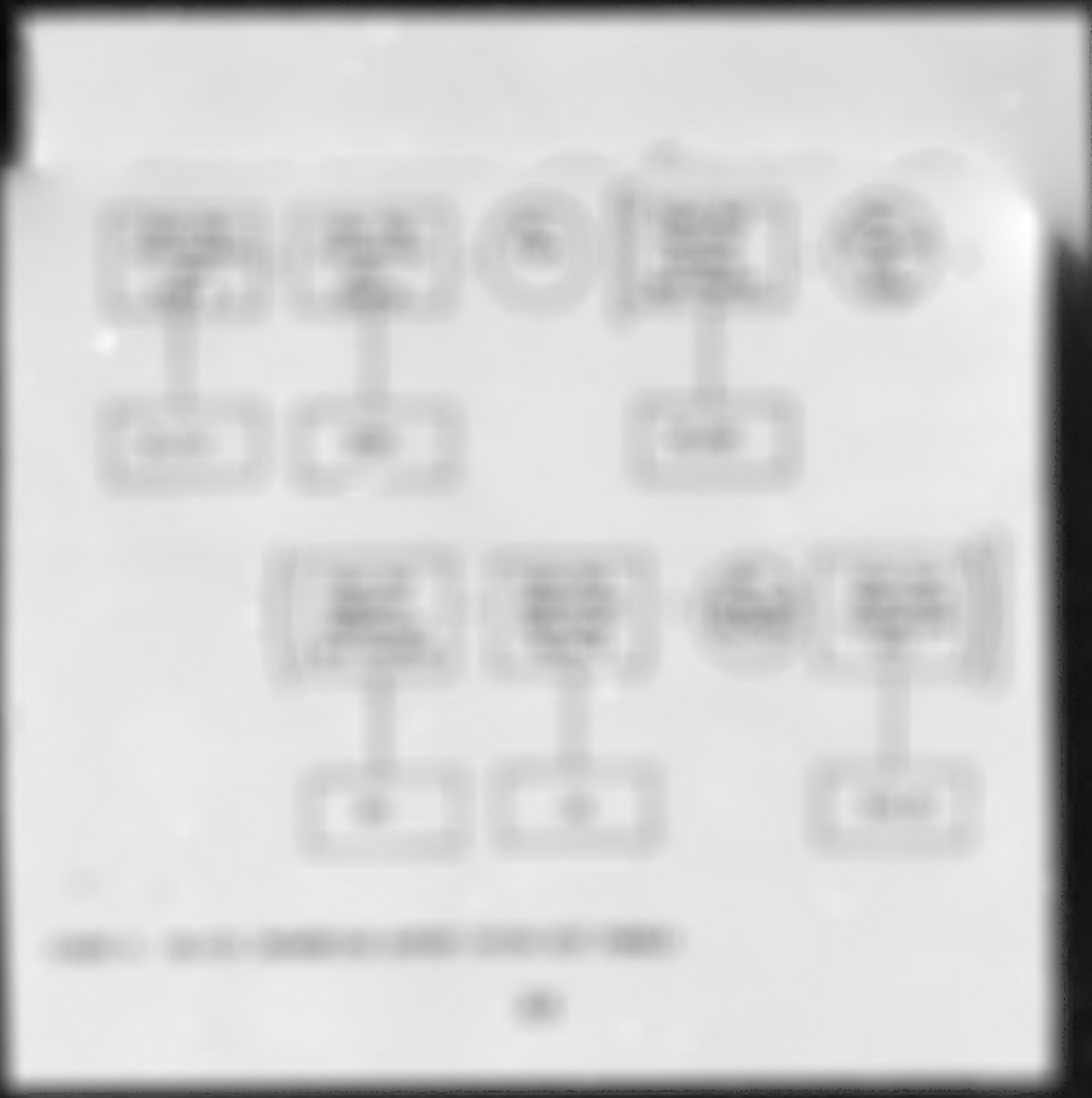
The estimates for the elements in the production, handling, and related coordination personnel were supplied by the Research Coordinating Center at the University of Kentucky, that produced the explicitly and technically essential for the DOE sources. Estimates for many elements in the delivery personnel were supplied by engineering personnel from the Federation of Rural Electric Unions. These persons were part of the group that was in charge of the present equipment for all the health and educational assessments using RTI-H. It should be pointed out that the cost figures excluded most of the in-delivery elements and gross estimates. Again, these figures, based on estimates but in 1995, do not take into account increases owing due to inflation.

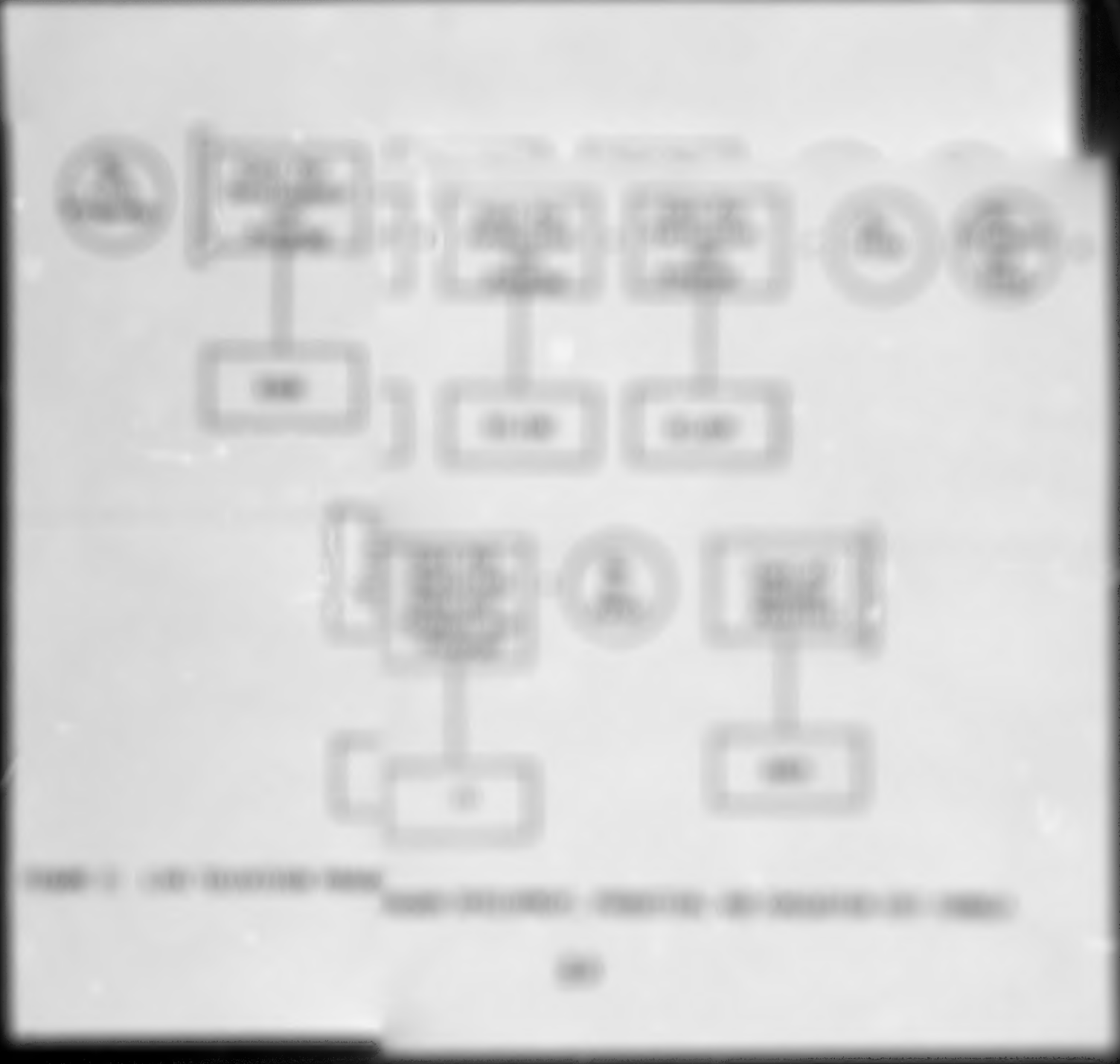
[illegible]

[illegible] of Computer Aids [illegible]

In Figures 1, 2, 3, 4, and 5 the flowcharts for computer aids to assist in developing, producing, and evaluating the [illegible] [illegible] are given. The nomenclature between each Figure, [illegible] [illegible] of each associated unit, the development of one unit of a particular product or activity associated with the Figure(s), are predominantly [illegible]. The series has nomenclature the number of units being associated in the range (e.g., number of 'R' programs, number of evaluators) are mentioned in the chronic formulated in Figures 1-5. Nomenclature 1, 2, 3, 4, 5 (1-5R17) assumed information has always been the unit of each [illegible] in each Figures.

In use has the 1st-level cards (exclude Figure 1). Figure 1 shows the part of the cost model that relates to the development, production, and evaluations of the lower 8-digits program over 1-5R17 months. The three boxes shows the models in the left-hand side of the quarter [illegible] the action cost for development, production, and evaluations for a [illegible] 8-digits program. These costs are R-dev, R-Prd, and R-Ev, respectively. The documentation for these costs appears in Nomenclature 7 and 8. The box on the right-hand side of the quarter shows [illegible] to the cost for producing the test reports and other evaluations that are needed





for a single program. These costs are also documented in Appendix B. The costs of data analysis per student need to be multiplied by the two circled items (number of sites X number of students per site) to obtain the data analysis costs per program for all students combined. the four terms within brackets are added toegether, the total cost per program of developing, producing, evaluating and analyzing the videotape materials is obtained. This total cost is then multiplied by the total number of taped TV programs included in the course (circled item outside the brackets at the far left of figure 1) to obtain the total cost for all taped programs for an AESP course. In the interest of brevity the other figures need not be described in this detail. The interpretation would, however, follow along the same lines.

A base figure of one unit was used to arrive at each dollar cost presented in the formulas. While this may be somewhat artificial, since producing 24 programs might not cost twice as much as 24 times 1, a base of 1 provides the flexibility necessary for manipulating the quantity of units. The base was formed by dividing by the number of units produced what it cost the AESP to develop, produce, and evaluate the entire learning package being considered. A limitation of a production cost formula developed this way is that no provision has been made for the decline in per unit cost that occurs in some cost analyses, when the number of units ordered at one time increases. Consequently, there is no economy of scale represented in the model and the resulting production cost parameter is likely to be inflated for cases involving large numbers of units.

A number of variables in the formulas can be altered to estimate costs for the AESP courses under different conditions. Two of the most important variables are audience size and number of programs. Tables 1, 2, 3, 4, and 5 present cost estimates for each component of the courses for different size audiences. Since the cost for developing, producing and evaluating a program is fixed, the more students who take a course, the less per student each activity in the course costs because the fixed production cost is distributed over a wider base of students.

TABLE 1

COST OF 12 TAPED TELEVISED PROGRAMS PRODUCTION

# of Sites with 20 Students/Site	# of Students	Cost	
		per Course	per Student
15	300	$107,424	$358.08
30	600	107,892	179.82
45	900	108,360	120.40
60	1200	108,828	90.69

For example, in Table 1, when 300 students view a taped TV program, the per student cost is $358.08. However, when the number of students is increased to 600, the cost per student drops to $179.82. As shown in subsequent tables, the situation is similar for live TV programs, audio reviews, and ancillary activities. The costs associated with the information systems (Table 5) do not show a similar trend since these costs are site specific.

Therefore, as the number of sites increases, the cost for information systems does not decline as markedly as the videotape production costs.

TABLE 2

COST OF 4 LIVE TELEVISED PROGRAMS

# of Sites with 20 Students/Site	# of Students	# of Panelist	Cost	
			per Course	per Student
15	300	2	$21,452	$71.51
15	300	4	24,652	82.17
30	600	2	21,584	35.97
30	600	4	24,784	41.31
45	900	2	21,716	24.13
45	900	4	24,916	27.68
60	1200	2	21,848	18.21
60	1200	4	25,048	20.87

Each table presents the costs for 15, 30, 45, and 60 sites with 20 students per site. The corresponding audience sizes are 300, 600, 900, and 1200. The figures for 300 students (15 sites) represent the original scale of AESP operation. The other figures represent doubling, tripling, and quadrupling the original effort. Twelve hundred students (60 sites x 20 students) was chosen to reflect the situation where one classroom site was located in each RESA or Local Development District in Appalachia.

TABLE 3

COST OF 12 FOUR-CHANNEL AUDIO REVIEWS

# of Sites with 20 Students/Site	# of Students	Cost	
		per Course	per Student
15	300	$13,716	$45.72
30	600	13,824	23.04
45	900	13,932	15.48
60	1200	14,040	11.70

TABLE 4

COST OF 12 ANCILLARY ACTIVITIES

# of Sites with 20 Students/Site	# of Students	Cost	
		per Course	per Student
15	300	$9,036	$30,12
30	600	12,384	20.64
45	900	15,732	17.48
60	1200	17,640	14.70

TABLE 5

COST OF ON-SITE LIBRARY AND INFORMATION RETRIEVAL SYSTEM

# of Sites with 20 Students/Site	# of Students	Retrieval System Uses per Student	Cost	
			per Course	per Student
15	300	3	$ 67,561	$225.20
15	300	10	88,981	296.60
30	600	3	126,859	211.43
30	600	10	169,699	282.83
45	900	3	186,157	206.84
45	900	10	250,417	278.24
60	1200	3	210,571	175.48
60	1200	10	214,855	179.05

It is possible that at some point increases in audience size would begin to have a negligible effect on per-student production cost. The reason for this is that the variable costs such as printing student response forms and analyzing the data gradually assumes such a large proportion of the total production cost that per-student cost is almost totally accounted for by individual analysis and printing charges. The basic development, production, and evaluation costs would become minimal.

Another variable of interest is the number of units produced. If the per-student cost for different numbers of units of a particular activity is compared for the same audience size, it is obvious that twice as many units cost twice as much using this cost model. This is true since a method of

diminishing costs for increased volume is not included in the model. The production costs are estimated as a linear function of the number of units.

The validity of this statement is evident in looking at Figures 1, 2, 3, and 4. Since 4 live programs cost $71.51 per student to produce (Table 2), 8 programs would cost twice as much, or $143.02 per student. Again, the situation is similar for taped programs, audio reviews, and ancillary materials.

In addition to assigning different values to the audience size and number of units produced in the cost formulas, the actual base costs (in the rectangles) can be assigned different values to reflect the degree of sophistication necessary in the programming for the prospective audience or the increased cost of producing the activity due to inflation. However, while an increase in the value of cost parameters causes per-student costs to rise, the cost does not rise as dramatically on a per-student basis if the course is intended for a large audience. For instance, if the development cost per taped program was increased to $5,000, the production cost increased to $15,000 and the evaluation cost increased to $4,000, it would cost $901.56 per student to produce 12 televised programs for 300 students, but only $246.56 per student to produce for 1200 students.

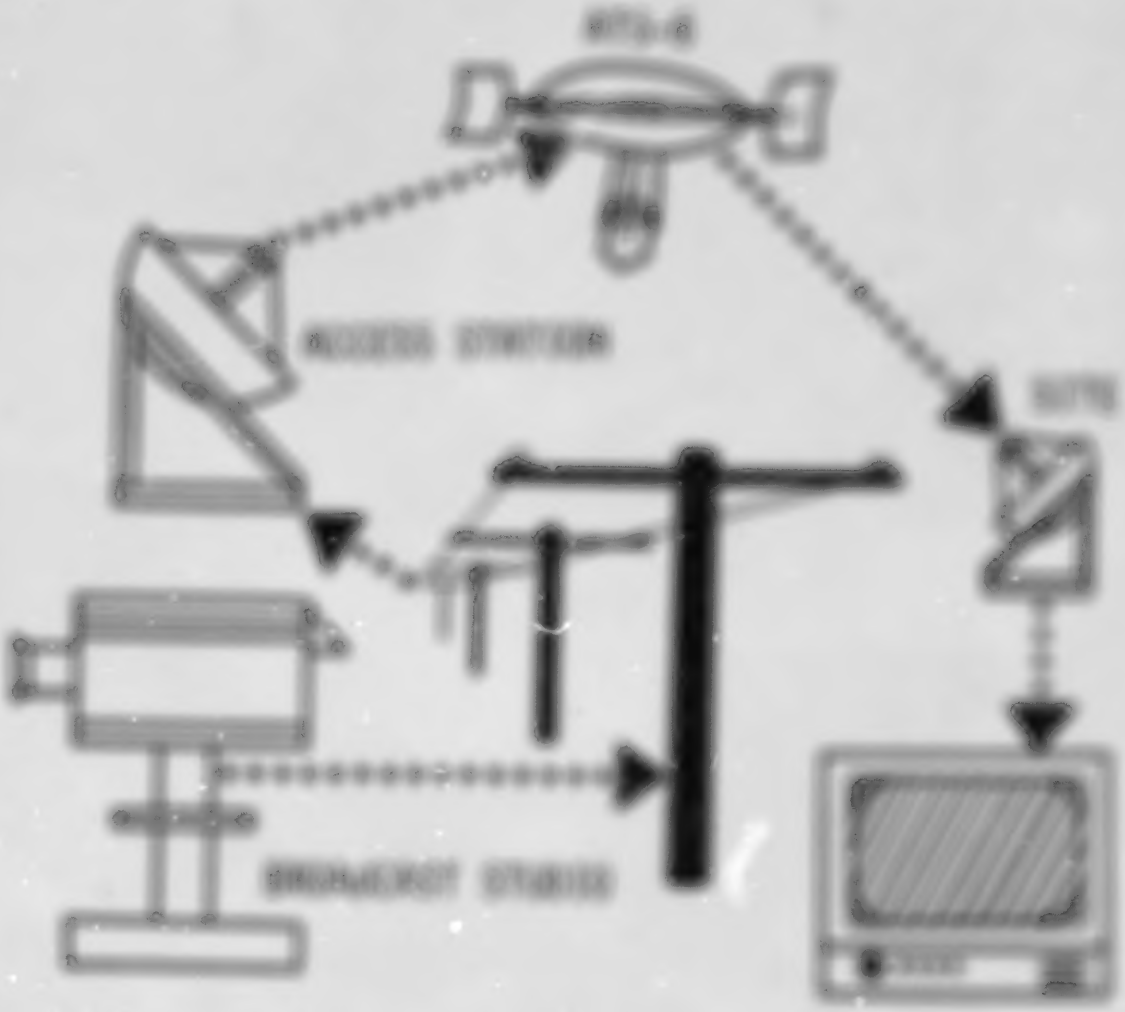
Manipulating the cost values in the on-site information support system demonstrates how cost constants may be adapted to describe different course emphases. If a second course is offered that is quite similar to one already given at a site, then much of the research on appropriate materials would already have been made and many of the materials would already be on site. In this case, the additional research and development

needs might cost no more than $1,000 and no more than $500 worth of materials would need to be added to each site library. This adjustment would reduce the cost of the information generator for 200 students (10 sites) from $225.25 per student to $108.81. This is a realistic way to cut per-student cost by more than one half.

Description of Delivery Cost Formula

Once a learning activity is produced, regardless of whether a video-tape or a printed media is used, it must be delivered from the production center to the geographically dispersed sites where those taking the course meet. To arrive at a more accurate idea of what a learning activity actually costs, it is necessary to add delivery costs to the development and production costs.

For example, in estimating the cost of the ancillary activities, the cost for printing and mailing each unit was simply added on to the production cost formula (Figure 6). However, two different satellite systems were used in the RESP project, ATS-6 and the less powerful ATS-5. Thus, to account for their use in the delivery of programs from the Lexington studio to the sites, it is necessary to separate the costs for these two systems in the formula for the delivery costs. With delivery costs separated from production costs, it is sometimes possible to use the same delivery formula for two activities. For instance, in the RESP course, both the taped and the live television programs made use of ATS-6 as the delivery system for audio-video transmission. In Figure 6, this delivery system is depicted. However, in the case of the live interactive seminars,



[illegible]

[illegible] Figure 5).

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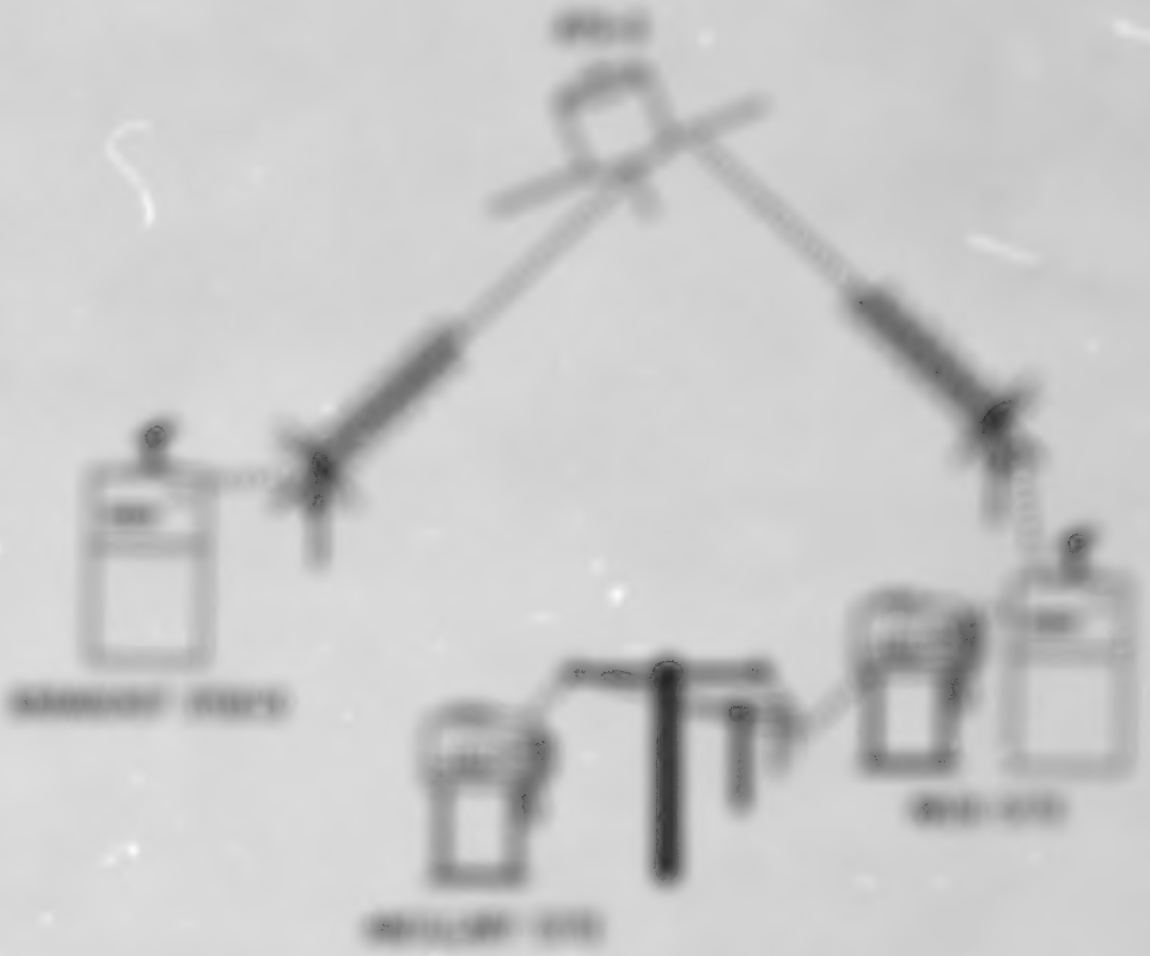

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TABLE 6

COST OF DELIVERY OF LIVE OR TAPED TELEVISED PROGRAMS AND FOUR-CHANNEL AUDIO BY SATELLITE

of Sites with Students/Site	# of Students	# of Hours per Transmission	# of Programs	Cost	
				per Course	per Studen
15	300	.33	12	$ 5,671	$18.90
30	600	.33	12	7,381	12.30
45	900	.33	12	9,092	10.10
60	1200	.33	12	10,802	9.00
15	300	.75	12	10,788	35.96
30	600	.75	12	12,575	20.96
45	900	.75	12	14,363	15.96
60	1200	.75	12	16,151	13.46
15	300	1.00	4	5,711	19.04
30	600	1.00	4	7,422	12.37
45	900	1.00	4	9,134	10.15
60	1200	1.00	4	10,844	9.04

A course length of two months is assumed. The length of transmission include program length plus satellite warm up time, therefore, .33 hours corresponds to the 15 minute audio review, .75 refers to a half hour taped program, and 1.00 refers to a 45 minute live seminar.

TABLE 7

COST OF DELIVERY OF VOICE/DATA BY SATELLITE AND LANDLINE
FOR 4 LIVE 1 HOUR TV PROGRAMS FOR 2 MONTHS

# of Sites with Satellite Capability	# of Sites with Landline Capability	# of Students	Cost	
			per Course	per Student
5	15	300	$5,008	$16.70
10	30	600	6,015	10.03
15	45	900	7,023	7.80
20	60	1200	8,030	6.69

The figures presented in Table 7 assume that a similar ratio of satellite capability to landline capability would continue to exist. Once again, an increased audience size reduces the per-student cost of the delivery of voice/data by satellite. As can be seen in Table 7, delivery to 300 students (15 sites) cost $16.70, while the cost of delivery to 1200 students (60 sites) drops to $6.69.

While, according to the production formulas, doubling the number of activities produced doubles the cost of production, it costs less than twice as much to deliver double the number of programs. The cost formula presented in Figure 8 indicates that maintenance costs are constant, and therefore are not affected by the number of programs. Thus, under this model the more programs broadcast during a month, the less maintenance cost assignable per program.

By inspecting the cost formula for television delivery by satellite even more closely, it becomes easier to see why costs per student decrease as audience size increases. The cost of having to equip a site is more than offset by distributing across a greater number of students the fixed costs for transmitting a particular number of hours by satellite.

It should be pointed out that the number of students effectively accommodated at one time by one television set and satellite receiver is limited to between 20 to 50 unless additional TV monitors, receivers, and amplifiers are purchased. Until formulas are developed to describe this expansion, it is necessary to treat larger numbers of students at a site that can be accommodated in one room at one time as an additional site. Under this model twenty rooms in a school simultaneously receiving television by satellite have to be treated as 20 sites.

To find out what it would cost to deliver a particular number of audio reviews to a particular number of sites, it is necessary to use both the cost formula for the delivery of televised programs, since the four audio channels are transmitted above the video spectrum, and the cost formula for the site audio review equipment, since special equipment is necessary to make the selection of specific audio channels possible. Further, if visuals are used with the four-channel audio, it is necessary to include the cost of the TV receiver and maintenance. The cost for the satellite delivery of the four-channel audio reviews is included in Table 6. As shown in the tables, the total hours of transmission are .33. This transmission time allows for a 15-minute review and an approximate 5-minute warm up time necessary for the satellite. The cost for the audio review equipment is

outlined in Table 8 for different audience sizes. Because the equipment is relatively site specific, increasing the number of sites does not lower per-student cost. The cost per student for review equipment is $3.23 for 300, 600, 900 or 1200 students. One way to reduce this cost would be to have more than 20 students at each site.

TABLE 8

COST OF 12 4-CHANNEL AUDIO REVIEW EQUIPMENT*

# of Sites with 20 Students/Site	# of Students	# Sites with Encoder	Cost	
			per Course	per Student
15	300	7	$ 970	$3.23
30	600	14	1,939	3.23
45	900	21	2,909	3.23
60	1200	28	3,879	3.23

*Each review is assumed to last .25 hours with .08 hours warm up time, therefore the length of each transmission is .33 hours. The course is assumed to last two months.

Description of Local Coordination Cost Formulas

The local coordination cost formula includes the cost of the site coordinator - needed at each site - the cost for an administrator, and a faculty consultant - needed for each site triangle (each group of 3 sites). If a site coordinator is paid hourly, then the more time spent in class, the greater the salary. However, the amount of time spent in class depends on the length and number of the various classroom learning activities

prescribed for the course. Besides estimating the cost for site coordinators monitoring a particular course, the local coordination cost formula in Figure 11 can estimate what it would cost for administrators and faculty consultants for every three triangles, centralized training of site coordinators, and overhead to the RESA's for the use of their facilities. Appendix J provides a breakdown of each of these cost factors.

The cost values presented in Figure 11 are based on what these activities cost during an experiment. If courses were regularly run, the per-course cost for local coordination might not be so high, since it might be expected that the indirect overhead to the RESA's might decrease and that site coordinators monitoring a course might not need retraining. Of course, as is the case with all the costs, alternative ways for performing an activity such as teaching the coordinators by means of a slide show, can become part of the cost model.

The per-student cost for local coordination for different audience sizes is presented in Table 9. The cost for 300 students (15 sites) is $445.14 and the cost for 1200 students (60 sites) is $438.70. Increasing the audience size does not have much of a decreasing effect on the local coordination parameter. The cost decreases slightly because some of the workshop costs are independent of the number of sites. One way to lessen costs would be to reduce the number of people used if it becomes evident that a faculty consultant, administrator, and three site coordinators are not needed for every three sites.

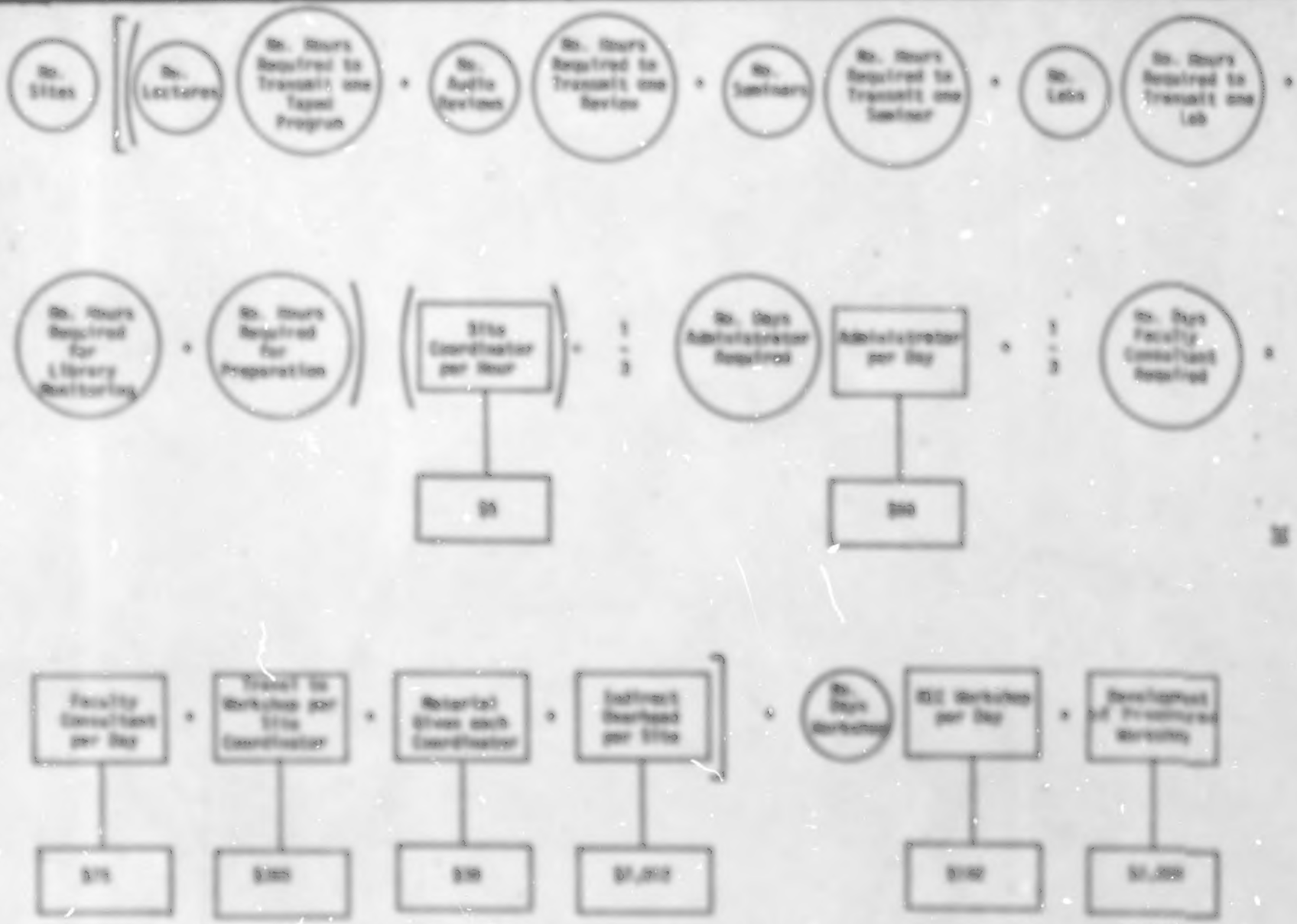

FIGURE 11: LOCAL COORDINATION COST FORMULA

TABLE 9

LOCAL COORDINATION COST*

# of Sites with 20 Students/Site	# of Students	Cost	
		per Course	per Student
15	300	$[illegible]	$[illegible]
30	600	$[illegible]	$[illegible]
45	900	$[illegible]	$[illegible]
60	1200	$[illegible]	$[illegible]

*Site coordinator is assumed to work 70 hours/course; administrators 20 days, faculty consultant ten days, and the workshop is assumed to last three days.

Description of Central Coordination

Central coordination costs are a function of management costs for both the ANC and the RCC as well as indirect costs and evaluation costs. The values presented in Figure 12 are based on the overall management costs for the REDP project. Because four courses were offered, the cost per course was calculated by dividing the total cost by four for each element in the formula. A detailed account of each number presented in Figure 12 is included in Appendix K.

The cost of central coordination per student for different audience sizes is presented in Table 10. The cost of $[illegible] per student for an audience size of 300 (15 sites) is unrealistically high due to the small number of courses offered. This factor also has an alleviating effect on the costs for the 600 students ($[illegible]), 900 students ($[illegible]) and 1200 students

FIGURE 11. CAPITAL CONSUMPTION COST FORMULA

TABLE [illegible]

CAPITAL CONSUMPTION COST

[illegible]	[illegible]	[illegible]	
		[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]. Note particularly, if a larger number of courses were offered, the overall maintenance cost would decrease considerably.

Another reason for the cost for overall maintenance is the [illegible] present in the maintenance costs of the offers. As one moves in the [illegible] maintenance programs, additional costs were incurred in this magnitude that would not be present when courses are regularly run. Therefore, overall maintenance costs would be expected to drop when the program was fully functioning as well as when a larger number of courses were offered.

Description of a Course

The total cost for a course is made up of the cost for instructors, promotion, and entertainment, materials, local coordinators, and general maintenance. In Table [illegible], total course costs are given for a series consisting of 12 based scholarship programs, 2 free seminars and 2 public lectures

[illegible]

[illegible]	[illegible]		
	[illegible]	[illegible]	[illegible]
[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

2. [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

1. [illegible]

2. [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

APPENDIX B

EVALUATION COSTS

Evaluation component budget for 1 course

1. Total salaries and benefits

Formative evaluation:	Evaluation Director and Evaluator	$ 6,068
Summative evaluation:	Evaluation Director and two Evaluators	13,864
	Total Salaries and Benefits	19,932

2. Current expenses

a) Office supplies	1,500
b) Travel	1,500
c) Communications	1,000
d) Consultants	2,623
e) Computer	460
f) Technical reports	300
g) Evaluation instruments (printing and analysis)	900
Total Current Expenses	8,283
Total direct cost	28,215
Total indirect cost	9,788

Breakdown of AESP evaluation budget for 1 course by activity

(activity costs are based on the total direct evaluation cost (28,215) minus the cost of printing and analyzing the evaluation instruments (900) = $27,315)

	Per Course
1. 12 lectures @ 50% of 27,315	1,138
2. 4 seminars @ 15% of 27,315	1,024
3. 12 audio reviews @ 10% of 27,315	228
4. 12 ancillary activities @ 3% of 27,315	68
5. Information systems @ 2% of 27,315	546
6. Management @ 20% of 27,315	$ 5,463

APPENDIX B--CONTINUED

Breakdown of cost for analyzing data per student by activity

(activity costs are based on the cost of printing and analyzing the evaluation instruments ($900).

	Per Student
1. 12 lectures @ 50% of 900 (÷12)(÷300)	.13
2. 4 seminars @ 15% of 900 (÷4)(÷300)	.11
3. 12 audio reviews @ 10% of 900 (÷12)(÷300)	.03
4. 12 lab activities @ 3% of 900 (÷12)(÷300)	.01
5. Information systems @ 2% of 900 (÷300)	.06
6. Management @ 20% of 900 (÷300)	.60

APPENDIX C

LIVE TELEVISION COST FOR DEVELOPMENT, PRODUCTION, AND SEMINAR PANELIST

Development of live seminar	
Total salaries and benefits for Mission Director	$ 1,230
Total direct cost	1,230
Cost per program (1230 ÷ 4)	308
Production	
1. Total salaries and benefits for Producer Director, Artist, TV Engineer, and Production Crew	4,290
2. Current expenses	
Production supplies	8,500
Total direct cost	12,790
Total indirect cost	2,107
Cost per program (÷4)	3,198
Cost of seminar panelist	
1. Honorarium 8 @ $100/day	800
2. Per diem 8 @ $25/day for 2 days	400
3. Travel 8 @ $250/person	2,000
Total cost	3,200
Cost of 1 seminar panelist (3,200 ÷ 8)	$ 400

APPENDIX D

FOUR-CHANNEL AUDIO REVIEW PRODUCTION COST FORMULA

Development	
1. Total salaries and benefits for Director and Reading Specialist	$ 4,490
2. Current expenses	
a) Narrator	200
b) Duplicating	23
Total Current Expenses	223
Total direct cost	4,713
Total indirect cost	2,147
Cost per program	393
Production	
1. Total salaries and benefits for Audio Technician and TV Engineer	2,755
2. Current expenses	
Production supplies	3,404
Total direct cost	6,159
Total indirect cost	1,353
Cost per program	$ 513

APPENDIX E

COST FOR DEVELOPMENT, PRINTING AND MAILING OF ANCILLARY ACTIVITIES

Development	
1. Total salaries and benefits for Mission Director and Graduate Assistant	$ 4,654
2. Current expenses	
a) Searches	120
b) Supplies	100
Total Current Expenses	220
Total direct cost	4,874
Total indirect cost	2,295
Cost per program	408
Printing and mailing per unit per student	
Printing and mailing	
3,000 for 300 students for 12 activities	$ .83

APPENDIX F

ON-SITE INFORMATION SUPPORT SYSTEM

Development	
1. Total salaries and benefits for Mission Director and Systems Development Specialist	$ 6,492
2. Current expenses	
a) Supplies	400
b) Printing and duplicating	425
c) Computer	400
Total Current Expenses	1,225
Total direct cost	7,717
Total indirect cost	3,165
On-site library per course	2,500
Cost for support materials per student	
$840 per site for 20 students' books and tests	42
Cost for retrieval system per use	$ 10

APPENDIX 5

SATELLITE DELIVERY OF TELEVISED PROGRAMS AND FOUR-CHANNEL AUDIO

Rental satellite per hour — 1,000

The rental cost for a 50 transponder satellite delivery system for audio-visual transmission is $1,000/hour. This is a middle figure in the range given in The Development of the Public Service Satellite Consortium by Lundgren, Potter, and Janney.

Ground receive-only reception per hour — .40

The ground receive-only equipment for reception of satellite delivered audio-video signals is $4,000 for the parabolic antenna system and receiver used in ACSP. The figure of .40 per hour was derived by dividing the cost by the expected life, 5,000 hours - a conservative estimate based on 1000 hours per year of use for 5 years.

TV Monitor per hour — .12

Color TV receivers cost $600 per site; this figure was supplied by a commercial supplier of television sets for schools. The .12 per hour figure is based on a conservative estimate for the life of the equipment of 5,000 hours based on 5 years with 1,000 hours of use per year.

Receive-only equipment maintenance per month — 50

Maintenance on one-way video equipment was $600 per site per year, or 50 per month. This figure was supplied by PBMS who were in charge of the ground reception equipment for the ACSP.

TV maintenance per month — 5

TV maintenance was $60 per year, or $5 per month per site. This figure was supplied by a company offering maintenance contracts.

APPENDIX D

TWO-CHANNEL AUDIO DECODE EQUIPMENT

Two-channel distribution system per head (TD)

Initial cost was $[illegible] and assuming a 7 year life, 50 weeks a year, 5 days a week, and 7 hours per day, per unit life is [illegible] 0 .[illegible]

Headset and headphone per unit per head (TD)

Initial cost was $[illegible] and assuming a 5 year life, 50 weeks per year, 5 days per week, and 7 hours per day, per unit life is [illegible]

City program decoder per head (TD)

Initial cost was $[illegible], and assuming a 5 year life, 50 weeks per year, 5 days per week, and 7 hours per day, per unit life is [illegible]

Transcription data on decode decoder

Reports were sent Without to transcribe $[illegible]

Decoder provider per head (TD)

Initial cost was $[illegible] and assuming a 5 year life, 50 weeks per year, 5 days per week, and 7 hours per day, per unit life is [illegible]

Task per decoder $[illegible]

Two-channel decoderness per decoder $ [illegible]

APPENDIX I

SATELLITE DELIVERY OF DOCUMENTS TEST

Manual semaphore system (MS-TS4) [illegible]

Manual semaphore is an independent semaphore operation system. This manual system consists of two operators, one operator is the sender and the other is the receiver. The sender is the operator of the flashing or hand signal to the Manual semaphore of the receiver. Manual semaphore consists of the following equipment: Flashlight, semaphore flag, semaphore flag stand, and battery.

Visual semaphore system (MS-TS5) [illegible]

This system has two-man system operation. The operation of semaphore of system is same as manual system. The sender and the receiver operator system and the [illegible] capacity. The flashlight or semaphore flag, semaphore flag stand, and battery.

Telephone system (MS-TS6) [illegible]

Telephone system uses the [illegible] as the [illegible] per minute per circuit. This is the basic unit of charge made by the [illegible] company.

Two-man audio message recording (MS-TS7) [illegible]

Microcassette of two-man audio message recorder per [illegible] per circuit is the [illegible] per minute. This circuit can transmit up to [illegible] per minute. [illegible] of the private telephone equipment [illegible].

Total [illegible]

APPENDIX 3

LEGAL DOMICILE OF [illegible]

[illegible] OF ASSETS

1. [illegible]
   [illegible] — [illegible]

2. [illegible]
   [illegible] — [illegible]

3. [illegible]
   [illegible] — [illegible]

4. [illegible]
   [illegible] — [illegible]

5. [illegible]
   [illegible]

[illegible] — [illegible]

[illegible] OF [illegible] AND [illegible]

[illegible] AND [illegible]

[illegible] — [illegible]

[illegible]
[illegible] — [illegible]

[illegible] — [illegible]

[illegible] [illegible]

1. [illegible] [illegible] [illegible]

   a. [illegible] — [illegible]
   b. [illegible] — [illegible]
   c. [illegible] — [illegible]

[illegible] — [illegible]

[illegible]

[illegible]

(1) [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

(2) [illegible]

(3) [illegible]

[illegible]

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[illegible]

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[illegible]

1. [illegible] [illegible]

[illegible]

1. [illegible]
   a. [illegible]
   b. [illegible]
   c. [illegible]
   d. [illegible]
   e. [illegible]

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[illegible]

1. [illegible]

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1. [illegible]
   a. [illegible]
      [illegible]
      [illegible]
   b. [illegible]

[illegible]

[illegible]